These are only a *few* sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the WebWork assignments, Problems Sets, in-class work, and your class notes.

1. Find the value of the following sums by hand

$$\text{(a)} \sum_{k=42}^{\infty} \frac{1}{4^k} \qquad \text{(b)} \sum_{k=0}^{326} \left(\frac{3}{7}\right)^k$$

2. Determine if the following sequences converge or diverge. If the sequence converges, find the limit.

   (a) $\left\{ \dfrac{\ln(k)}{\sqrt[3]{k+1}} \right\}_{k=1}^{\infty}$

   (b) $\{a_k\}_{k=1}^{\infty}$ where $a_k = \displaystyle\int_1^k \frac{1}{1+x^2}\, dx$

3. (a) Is it possible that the terms of a series converge but the partial sums diverge? Explain.
   (b) Can the partial sums converge but the terms diverge? Explain.

4. Show that the following series converge.
   How accurately does S_{75} approximate the exact value of the series?

$$\text{(a)} \sum_{k=6}^{\infty} (-1)^k \frac{17}{k! + k^2} \qquad \text{(b)} \sum_{k=1}^{\infty} 2k^3 e^{-k^2}$$

5. Do the following series converge or diverge? Be sure to justify your answer by giving reference to the appropriate theorems and/or tests.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{n}{\pi n - 1}$

   (b) $\displaystyle\sum_{k=10}^{\infty} \frac{3}{4k - 2}$

   (c) $\displaystyle\sum_{k=3}^{\infty} \frac{2k}{4k^8 + 7k^2 + 6}$

6. Let $\mathcal{I} = \displaystyle\int_0^1 \cos(x^2)\, dx$.

   (a) Calculate $\mathcal{I}$ accurate within 0.001 by hand without the use of a calculator.
   (b) Find a value of n such that M_n approximates $\mathcal{I}$ accurate within 0.001.
   It may be useful to know that the absolute value of the second derivative of $\cos(x^2)$ is less than 4 on the interval $[0, 1]$.

7. Determine the exact values of the following series.
   It may be helpful to write out a few terms of the series to try to identify the pattern.

$$\text{(a)} \sum_{k=0}^{\infty} \frac{1}{3^k\, k!} \qquad \text{(b)} \sum_{k=0}^{\infty} (-1)^k \frac{\left(\sqrt{3}\right)^{2k+1}}{2k+1}$$